



November 9, 2010

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USAID – Office of Infrastructure, Engineering and Energy (OIEE)
Café Compound
U.S. Embassy
Great Masood Road Kabul, Afghanistan

Re: WO-A-0053 ACEP Report Review

[REDACTED]

Per the administrative work order scope, attached is a mark-up of the *ACEP Power Sector End Use Energy Efficiency Strategy Draft Report* dated October, 2010. Tetra Tech has suggested minor editorial changes.

Upon concurrence, Tetra Tech can forward these comments to [REDACTED] of ACEP (IRG) and then work can commence with IRG to finalize the ACEP report.

Please contact [REDACTED] in our office if you have any questions or comments regarding this review.

Respectfully,

[REDACTED]

[REDACTED]
Chief of Party (OIEE-AESP)
Tetra Tech EM Inc.

Cc: [REDACTED] (USAID-POC)
[REDACTED] (TT-Technical Lead)



USAID
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AFGHANISTAN CLEAN ENERGY PROGRAM

POWER SECTOR END USE ENERGY EFFICIENCY
STRATEGY
FINAL DRAFT REPORT

OCTOBER 2010

This report was produced for review by the United States Agency for International Development (USAID). It was prepared by International Resources Group (IRG).

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DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government

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ACRONYMS

ACEP	Afghanistan Clean Energy Program
ADB	Asian Development Bank
AERA	Afghanistan Energy Regulatory Agency
ANSA	Afghanistan National Standards Agency
BSP	Basic Strategic Principles
CFL	Compact Fluorescent Light
DABS	Da Afghan Breshna Sherkat
DSM	Demand Side Management
EE	Energy Efficiency
GIRoA	Government of the Islamic Republic of Afghanistan
G&T	Generation and Transmission
GWh	Gigawatt hours
IBs	Incandescent bulbs
IRG	International Resources Group
KED	Kabul Electricity Directorate
KWh	Kilowatt hour (1,000 watt hours)
LED	Light Emitting Diode
MEW	Ministry of Energy and Water
MW	Megawatt (1,000 kilowatts)
NEPA	National Environmental Protection Agency
SWH	Solar Water Heater
TWh	Terawatt hour (one trillion watts)
USAID	United States Agency for International Development
WB	World Bank
TERI	page 8. ?

1. INTRODUCTION

This summary document has been prepared in response to a USAID requirement that International Resources Group (IRG), under its Afghanistan Clear Energy Program (ACEP) contract, deliver a Strategy Report based on the findings of the “*Energy Efficiency Assessment Report*.”

The specific terms of reference for the Strategy presentation call for a discussion of the following topical areas:

- a) Objectives and targets
- b) Core activities and rationale or their selection
- c) Possible barriers and how the proposed activities will deal with them
- d) Institutional arrangements and roles of various players
- e) Cooperation with other donors and their activities
- f) Interaction with other power planning or power sector reforms of distribution utilities
- g) Costs, benefits, and payback periods for various activities

We have added one additional item to help USAID get a broad perspective on other donor and stakeholder stated interests (from direct discussions at the National Energy Efficiency (EE) Conference) – that is, a *proposed program financing plan, split into Government, donors, and private sector categories.*

We begin the report by defining the Vision and the Mission for the initiative and then define Basic Strategic Principles (BSPs) to guide the strategy definition. Finally, we present in detail the elements of the strategy and an implementation plan that take into consideration the constraints and barriers identified in the Assessment Report.

2. VISION

by implementing a Demand Side Management (DSM) program

The Government of the Islamic Republic of Afghanistan (GIRoA) will make all efforts possible to increase end use energy efficiency in its power sector and in doing so, make large quantities of existing power available to new customers.

Note: The ACEP Assessment Report showed that possible savings today are a staggering 100 MW of demand and 350 million kWh/ year of consumption. Based on recent survey data, these resources could be converted into new electricity supply to 2 million people (if connections are made available).

3. MISSION

The strategy will provide specific guidance to the GIRoA to capture these benefits and extend available power resources to as many citizens as possible.

4. THE SIX GUIDING PRINCIPLES

The strategy will focus on programs and activities leading to rapid, meaningful, tangible, and lasting results in the specific context of Afghanistan (mainly urban). The six guiding principles are:

- contradictions
- Herzt
1. Focus on the top five cities of Afghanistan (Kabul, Kandahar, Jalalabad, ~~Herat~~ ^{are} and Mazer-e-Sharif). By 2015, these cities are expected to have a total population of about 10 million people, of which a large number ~~is~~ ^{are} expected to be without access to the existing grid due to energy supply constraints.
 2. Carry out a two-pronged approach that will involve simultaneous implementation of (1) needed institutional programs and reforms with concerned ministries, agencies, and universities (e.g., Kabul University and Kabul Polytechnic University) and (2) sound technical programs that are justified from economic, financial, environmental, and implementation risk standpoints.
 3. Provide the appropriate legal, regulatory, and institutional environment to allow the development of a strong private sector EE industry (Energy Service Companies, energy auditors, maintenance technicians, and engineers)
 4. Policy definition and coordination, regulations, and monitoring and evaluation roles must remain within the mandate of the Government.
 5. Promote and implement EE in off-grid systems e.g., Bamiyan via dissemination of modern technologies such as: compact fluorescent lamps (CFLs) and light emitting diodes (LEDs), solar water heaters (SWHs), prepaid meters, economic tariffs in all off-grid systems, EE housing in the rural areas, energy efficient cooking stoves, etc.
 6. Ensure fair distribution of benefits among all categories of customers and regions by implementing activities throughout cities and regions and sectors according to their economic weights and needs.

5. QUANTITATIVE OBJECTIVES AND TARGETS

The proposed strategy has the following and related objectives set out for 2013 (from the ACEP EE Assessment Report, ~~Chapter 6~~ [?]).

1. To achieve peak load demand savings of no less than 30 MW nationwide by the end of the ACEP lifespan (5-10% of total peak load), thereby avoiding the equivalent in new Generation and Transmission (G&T) (\$150 million)
2. To achieve energy savings, especially during peak hours, of no less than 15% of total projected national grid power consumption of 2.36 TWh or 350 GWh worth in excess of \$20 million annually
3. To facilitate the “transfer” and “conversion” of these savings into new supply for new customers (350 GWh equals 3.5 million new customers, increasing the electrification rate from 20 to 33%)
4. To support the development of a sound and profitable private Energy Service Industry with total sales of no less than \$10 million/year and employing hundreds of professionals (energy auditors, economic and financial analysts)

These objectives and targets, as well as the expected outcomes listed below, are outlined in the Assessment Report. These objectives and targets have been validated by the Ministry of Energy and Water (MEW), its EE Advisory Committee, and the participants of the First National EE Conference held in Kabul, Afghanistan on July 27, 2010.

5.1. EXPECTED OUTCOMES (BY THE END OF 2013)

- Over 300 professionals trained through specific programs developed by ACEP with local Universities and technical centers (largely in five cities)
- Over 1 million Afghans reached by outreach campaign
- 50,000 new CFLs being used in outdoor applications, saving 5 MW

- 500,000 new CFLs being used in government buildings, saving 10 MW
- 1 million new CFLs being used in low income households, saving 30 MW
- 10,000 new solar water heaters installed in large public buildings in the next three years, half of which located in government buildings, through a subsidy funded by donors
- 1,000 of the largest customers regulated with savings targets of 5% per year for 5 years, saving 5 MW
- Promotion of energy efficient housing in rural areas resulting energy saving and better quality of life
- Development of energy efficient cooking stove saving fuels and environment

Note: All MW savings are not additive and the coincidental effect of these measures is estimated at 30-40 MW.

5.2. INSTITUTIONAL INITIATIVES (2010-2013)

- **Outreach:** TV, flyers, radio, billboards nationwide, starting with Kabul and the other four major cities, starting in the last quarter of 2010
- **Capacity building:** Over 300 professionals trained across all regions by universities and technical institutes
- **Pricing and metering:** Time of the day tariffs for large users (100 kW) to be proposed to the new Afghanistan Energy Regulatory Agency and Da Afghan Breshna Sherkat (DABS) in 2011-12
- **Codes, norms, and standards:** Established in 2011-12 by the Afghan National Standard Agency (ANSA) for CFLs, SWHs, electric motors and pumps, and home appliances
- **Taxation and/or ban** of inefficient equipment (Incandescent bulbs (13s) large low power factor motors, etc.) to be implemented in 2011-12 after recommendation from ANSA
- **Other:** Incentives for distribution companies and rural off mini-grids; energy efficient housing, building code, etc.

distribution systems

5.3. EXPECTED BENEFITS:

1. Save money for customers
2. Save energy
3. Increase availability of power to meet demand
4. Eliminate market distortions
5. Improve service
6. Increase electrification rate
7. Provide incentives to accelerate the adoption of EE technologies
8. Improve the environment
9. Private sector development
10. Better quality of life

6. BARRIERS

The market barriers include:

- **A lack of commercial and economic drivers for EE implementation**, which may be addressed by facilitating and promoting the local EE market and removing impediments and disincentives for corporate and end-user EE investments.
- **The DABS incentive structure** that ties company financial performance to energy sales, not energy service or avoided costs.
- **A lack of financial incentives in the form of tariffs** that do not reflect the full costs of providing supplies, thereby “undervaluing” energy use, especially during evening peak hours.
- **A lack of finance** from existing capital sources and from within enterprises, which lack awareness of how rapid payback EE investments increase profits. There are a few sound domestic banks that lend actively. Interest rates are high, and some interest rate subsidies for EE may be advisable. But these banks need to be educated in assessing risk for EE projects, and in issues of collateral.
- **Sub-standard technologies**, such as CFLs, that are counterfeit or manufactured to unacceptably low standards risk damaging the entire market for a technology, which need the oversight of a credible Norms and Standards Organization such as ANSA. Such an organization/agency is also needed for the recycling of burnt-out bulbs to ensure proper mercury disposal.

The non-market barriers include:

- **A lack of information, knowledge, and experience** amongst residential, commercial, industrial, low-income and small business energy consumers on the costs, benefits and effective approaches – “best practices” – for securing EE.
- **A general absence of the cadres of trained technicians and engineers** needed to deploy and maintain many EE technologies. There is a small cadre of EE specialist at the MEW, EE Advisory Committee, but almost no implementation capacity in the country.
- **Broader institutional obstacles** to the increased use of energy efficient technologies and practices such as public sector consumers who do not pay and are therefore immune to financial incentives, poor governance in the power sector, and limited influence of the central government.

International experience has demonstrated that identifying the most promising programs and barriers to address is not sufficient to ensure overall program success. In addition to sound technical, economic, financial, social, and institutional analysis and a systematic approach to removing the main market and non market barriers, a number of prerequisites are needed. These have been prioritized as the following **Five Imperatives**:

- Securing Government commitment and if feasible, one or more “champions”
- Developing and implementing appropriate policy, regulations, and incentives
- Appropriating dedicated budgets
- Ensuring clear implementation responsibilities among concerned organizations
- Institutionalizing strong and independent monitoring and verification of energy savings

- Developing selected models such as energy efficient housing in rural areas, energy efficiency cooking stove etc.

To overcome these barriers in tandem with efforts to satisfy these imperatives, the following three-pronged approach is recommended:

A. Develop a series of short term (1-3 years) high impact, highly replicable and high return activities

Such activities have a high potential of being successful in Afghanistan based on past experience here and in other countries with similar energy sector constraints See Assessment report for details.

B. Initiate a longer term institutional and reforms process to ensure that these activities can be successfully carried out without facing deep counterproductive cultural and institutional practices (pricing, capacity development, codes, norms and standards, taxation, incentives and enforcement). *Of all recommended programs, the training and capacity building is the most important, after awareness development.*

C. Implement high impact, highly replicable demonstration projects e.g., low cost SWHs, LEDs, new power pricing and metering etc. to prepare the market for the next generation of EE technologies.

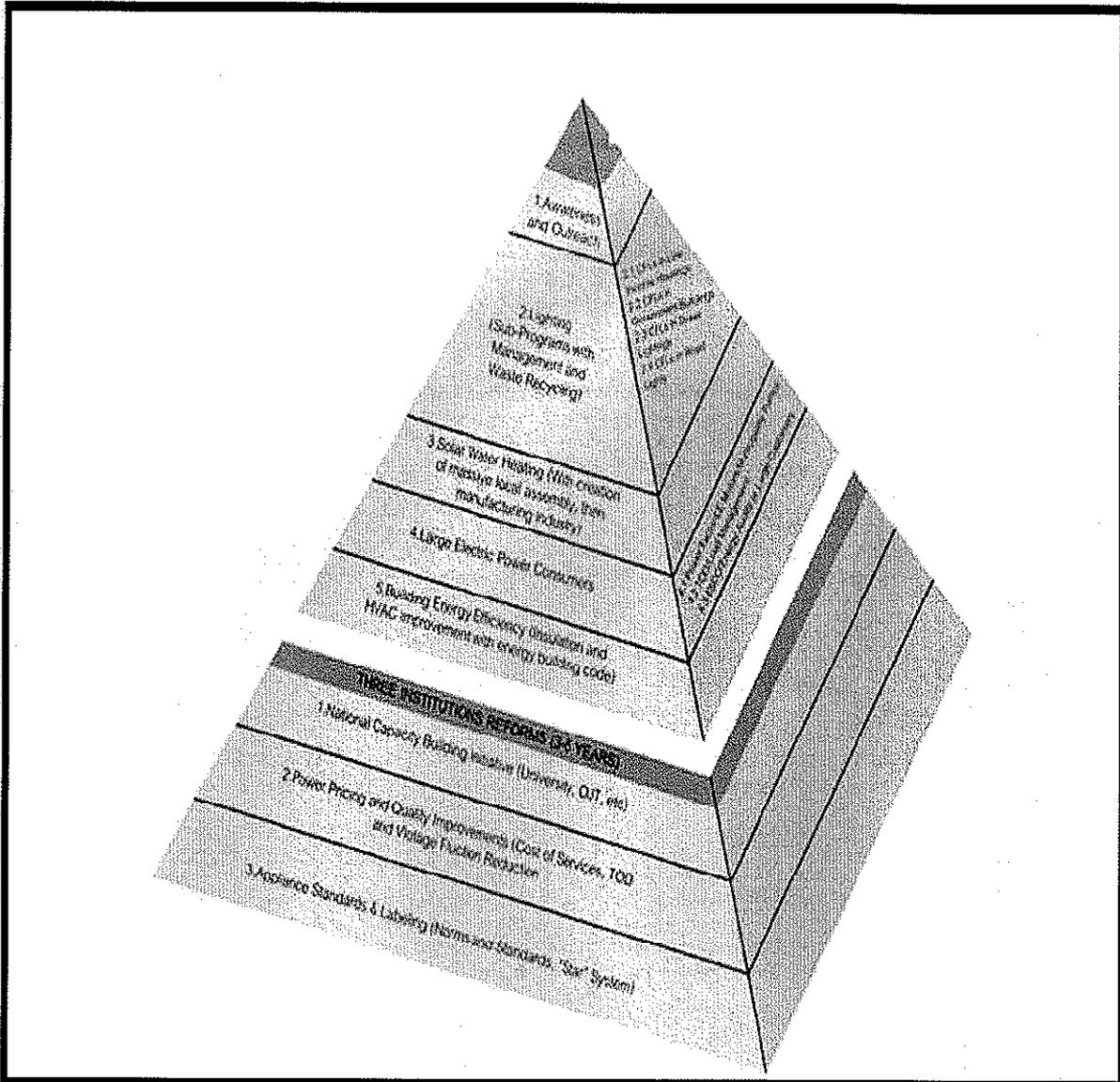
D. Demo projects such as Energy Efficiency housing in rural areas, energy efficient cooking stoves in some of the major cities like Bamyan, Herat, and Jalalabad.

The combined set of recommended initiatives is represented graphically in the form of a pyramid (see below). The foundation consists of needed institutional reforms, without which all technical programs would fail.

Herat

Are there four prongs because this one has been repeated?

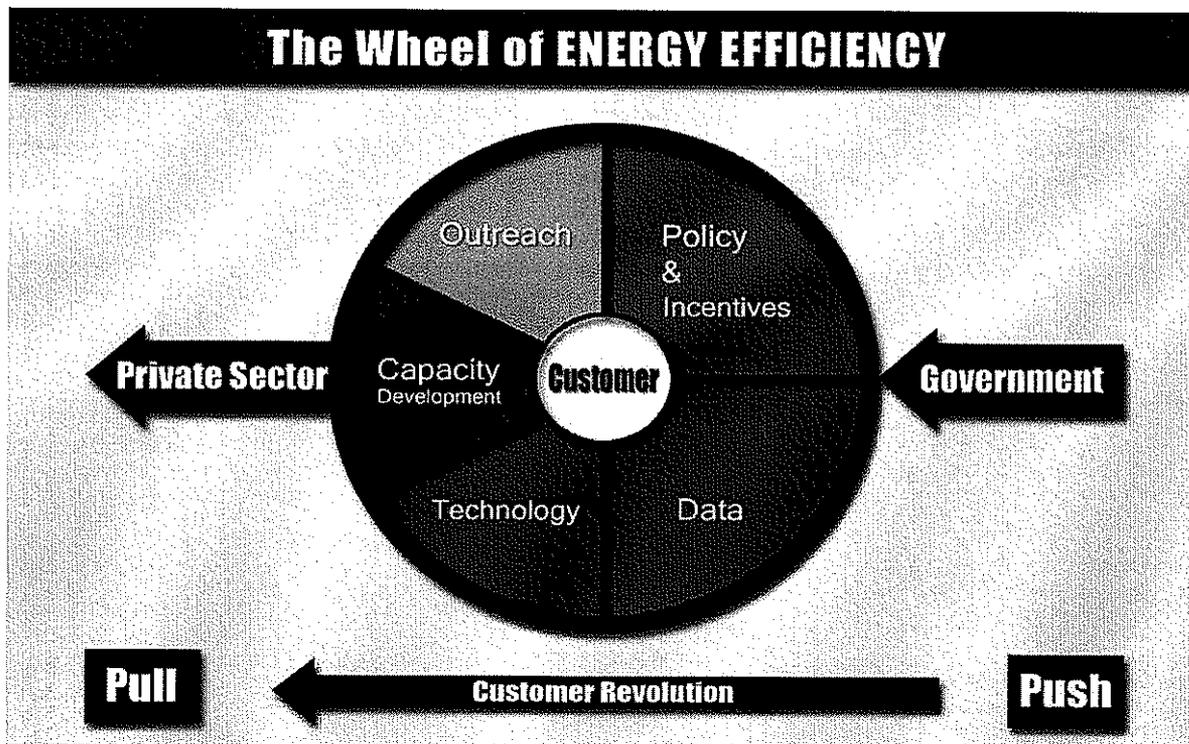
6.1. PYRAMID



In addition, concerned organizations must have clear roles and responsibilities in the design, implementation, funding, and monitoring processes of all projects. For example, part of the new Energy Fund to be established into the future Afghan Energy Regulatory Agency should be dedicated to EE on a revolving basis. Also, DABS should establish load research and DSM cells at each of its main distribution subsidiaries. Indeed, establishing strong and credible monitoring and verification mechanisms for reporting actual energy savings is also an essential step.

In order to achieve lasting success it is critical that the government and the private sectors work as a partnership, with the Government “pushing” the market and the private sector pulling it.

6.2. WHEEL OF ENERGY EFFICIENCY



Although Afghanistan's current energy consumption is very low by international standards, an aggressive EE *& DSM* strategy is needed to capture most of the current and future potential savings identified in this report. Between now and 2013, Kabul and other cities throughout Afghanistan have a remarkable window of opportunity to virtually free themselves **from the burden of having to draw on costly diesel thermal power**. This can be accomplished by reducing the evening peak load by 30 MW in 2013 and 50 MW by 2015. Such a reduction would:

- Reduce the need for future G&T investments by up to \$150 and \$250 million respectively at a cost of only about 10 percent of these amounts
- Reduce consumption and the cost of the fuel (diesel), which would decrease greenhouse gas emissions to the environment
- Reduce low-income tariff subsidies
- Free up capital for other national priorities
- Generate new private sector businesses and jobs
- Act as a catalyst for the Afghan economy to adopt more advanced technologies and develop advanced skills for its manpower
- For each kWh saved at end use, 2 kWh can be freed upstream and made available to new customers, enhancing the economic return on G&T investments and increasing revenues for DABS and other suppliers.

6.3. ROLES

EE is the business of many if not all. However, like any other major cross-cutting critical need e.g., education or security, it needs a leader or a "champion." This leader or champion can be an individual e.g., the president or an organization, and such arrangements generally change with time as progress is made.

In the case of EE in Afghanistan, there are two existing government organizations which have already claimed such responsibility, and no such non-governmental organizations or private sector organization. They are the MEW for electric power and National Environmental Protection Agency (NEPA) for other energy sources (fuel, wood, etc.). The Ministry of Commerce has jurisdiction on commercial fuels.

In the following table, we present recommended roles for most concerned organizations.

Organization	Role	Initiate	Implement	Fund	M&V
MEW		x		x	xx
Ministry of Economy				xx	xx
Ministry of Urban Development			x	x	xx
Ministry of Information and Culture		x	x		xx
Ministry of Women's Affairs		x	x		xx
DABS		x	xx	xx	xx
ANSA			xx	x	
NEPA		x		x	xx
KU, KPU		x	xx		
NGOs		x	xx	xx	
Private Sector		x	xx	xx	
Donors		x	xx	xx	xx

Because this strategy focuses on electric power, the MEW (later with Afghanistan Energy Regulatory Agency – AERA) should take the lead in formulating policy and regulations, and DABS spearhead implementation in coordination with NEPA through the National EE Advisory Committee.

7. COOPERATION WITH OTHER DONORS AND THEIR ACTIVITIES

As discussed in the Assessment Report, the World Bank (WB) has expressed interest in EE. So far, the WB's involvement has been limited to three activities:

1. A study of efficient lighting options (2009)
2. A series of building energy audits with TERI of India
3. Support to the MEW's EE sub-department with the funding of 2-4 EE engineers. However, despite providing salaries higher than those offered by the MEW, it has proven difficult to retain these engineers.
4. The WB remains interested in continuing to support EE activities, but a lack of local government staff has so far prevented them to be fully engaged.

The EU, GTZ/KfW, and the Asian Development Bank have also indicated interest in these activities.

8. INTERACTION WITH OTHER POWER PLANNING AND POWER SECTOR REFORM OF DISTRIBUTION UTILITIES

DABS has currently a number of technical assistance programs that would complement an EE/DSM initiative. They are:

- The USAID-funded Kabul Electricity System Improvement Program (KESIP) program
- The USAID-funded Afghanistan Infrastructure and Rehabilitation Program (AIRP)
- The USAID funded Afghanistan Energy Capacity Building Program-
- The MVV management program
- The SMEC engineering support program

Of all these programs, KESIP and AIRP are currently the most related to demand related activities.

9. COSTS, BENEFITS AND PAYBACKS FOR RECOMMENDED ACTIVITIES

In the Assessment Report, we have provided a detailed cost/benefit analysis of key EE/DSM measures that were subsequently “bundled” into five initiatives, three policy reforms, and four demonstration projects. In Annex 9 we present a summary of an estimate of the total program implementation costs and financing plan (private sector, donors, and government). All of these benefits could be achieved at a total cost of less than \$40 million to the GIRA and donors over a three-year period.

10. CONCLUSION AND RECOMMENDED NEXT STEPS

Based on our findings, recommendations and proposed implementation strategy, we recommend that USAID, MEW, and its main partners discuss and agree on the next steps. ACEP recommends that the MEW, DABS, all other key Afghan partners enter into a dialogue with donors in the next few weeks and ahead of the FY 2011 budgeting period to develop an agreement on funding preferences, scheduling, and coordination of their activities. The existing national EE Advisory Committee (soon to be an Inter-ministerial Committee for Energy Subcommittee) could provide the ideal forum to hold these discussions.

ACEP stands ready to provide support services to organizing and providing follow up to this important meeting and playing a significant role in the program implementation in the next three years.

Recommendation

More specifically, ACEP is in a unique position to organize and support the **implementation of the priority technical programs, such as re-lamping, Bamyan (CFL, LED and pre-paid meters), energy efficient housing in rural areas, energy efficient cooking stove and Solar Water Heaters as well as initiate the Awareness campaign and the Capacity Building effort in cooperation with the USAID Afghanistan Capacity Building Program.** Next priorities should be the establishment of the DABS DSM cells at all the centers and the design of other relevant energy efficient technologies.

ANNEX I. DSM MEASURES COST-BENEFIT ANALYSIS TABLE

Summary of DSM Measures

DSM Technology	Main DSM Assumptions										Total National (Saving US \$ million)				of which private sector		Net Prog. Cost
	Target in Units	Target in US\$/kWh	Savings in %	Hours of Operation	Peak Hours AM	Off Peak Hours PM	Peak Hours PM	MWh/yr	Morning Peak	Evening Peak	Off Peak	Total Customer saving US \$ million	Total Cost US \$ million	Total Cost US \$ million	Net Prog. Cost		
Awareness and Outreach Campaign (No. Of People)	3,000,000	60		2	NA	NA	NA	NA	70,000	NA	NA	NA	4.2	4.2	1	0	1
Urban Re-Lamping Programs																	
CFLs for Res. Outdoor	50,000	120		75					13,870	0	9,293	4,577	1.66	2.2	0.15	0.05	1.0
CFLs for Road & Street Lighting	10,000	200		75				8,322	0	5,576	2,746	1.66	1.3	0.1	0.0	0.1	0.1
CFLs in Govt. Buildings	500,000	200		75				80,652	0	0	80,652	16.1	4.8	1.5	0.0	1.5	
CFLs in Low Income Housing	1,000,000	30		75				274,480	34,310	85,775	##	8.2	30.7	3.0	0.0	3.0	
SWH for Large Customers																	
TOD/Load Management	1,257	200		10				29,200	2,433	6,083	20,683	0.9	2.8	12.0	9.0	3.0	
Power Factor/High Eff. Motors/Muni. Pumping	500	200		25				9,125		11	11	0.5	0.5	0.9	0.0	0.9	
ESCO/Energy audits at large customers	125	200		20				11				2.0	2.0	0.3	0.0	0.3	
New Buildings Initiative (Sq. Meters)																	
	100,000	200		40				6				0.39	2.2	2.2	6.9	3.5	3.5
TOTALS													38.6	51.8	35.9	19.5	17.4

1. Source: KURD note
 2. Interview with Mr. Resooli, Dy. Mayor on June 5, 2010
 3. ACEP estimation based on discussion with DABS/KED and government representatives: 10% of total number of units in Kabul
 4. Estimates based on ACEP survey and KED/MQOD consumers data indicate the number of remaining 1B is about 40% of total of 5 Million
 5. Official tariff structure for Kabul as of June 2010; See chapter 1 for details
 6. Generately accepted target based on Eco-Asis study. This target is consistent with Kabul data where the change is primarily from 60 w/1B to 13 w CFL
 7. Marginal cost/avoided cost per kWh have been assumed as follows: Morning peak 0.02 (hydro), evening 0.21 (Tarakil TPP), off peak 0.05 (imports)
 8. Outdoor lights have been assumed to operate 12 hours a day of which 5 in evening peak, similar assumptions for road lights
 9. Government building lighting assumptions are as follows: lights on 12 hours a day (7 am to 7 pm), 5.5 days a week all off peak hours
 10. Low income housing lighting assumptions are as follows: 2 hours morning peak plus 5 hours evening plus 9 hours off peak, a total of 16 hours a day (source Kabul survey)
 11. Solar water heater (10,000 units in 2011, 20,000 units in 2012 and 30,000 units in 2013)
 12. Target population equal 10% of commercial (1165), 100 others for industrial, pumping, military of a total of 1257 (Source DABS)
 13. Average load 50 KW, saving 10% or 5 kw, 5 hours a day equal 25 kw per day per site. New tariff assume to be 30 cents (15 Agh) and 6 cents (3 Agh off peak)
 14. Saving resulting from pfm assumed at 10% of total consumption
 15. Assuming 1,000,000 sq m new construction every year in Kabul of which 600,000 in residential and 250 in commercial, plus 20% informal
 16. Based on data from India for new building we assume base line consumption at 150 Kwh per sq m per year period, 40% saving means 60 Kwh/sq m/yr
 17. Assuming cost of high quality construction with international EE building code at 200 \$/sq m vs 120 \$/sq m traditional construction Le sur cost of 80 \$/sq m
 18. A review of campaign in 50 countries as resulted into 1-5 % saving in the first year for the sake of Afghanistan we choose 2% because of excellent establishment of TV every where.
 19. By 2011 Afghanistan will consume 3.5 TWh @ 2% will be 70 GWh.

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